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AGRICULTURAL EDUCATION.

AN ADDRESS

BY

PRESIDENT ABBOT,

Of the Michigan State Agricultural College.

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ADDRESS

OF PRESIDENT ABBOT OF THE STATE AGRICULTURAL COLLEGE BEFORE
THE HOUSE OF REPRESENTATIVES OF THE MICHIGAN LEGISLATURE,
MARCH 4, 1875.

KNOWLEDGE IS POWER.

For a long time, says Sallust, a Roman historian, the discussion prevailed among men whether military success depends more on the energies of the mind or of the body. In his opinion history had rendered a verdict in favor of the mind, and he adds that through mental energy must architecture, navigation and agriculture hope for any triumphs.

The world was for many ages coming up to this opinion of the ancient Roman, until at last Lord Bacon supplied these later ages with its watchword in the short sentence "Knowledge is power."

So far as physical science is concerned, these words were in Bacon's day more a prophesy than the statement of a fact. It is no longer so. In water changed into steam we possess a powerful agent for all work. We transform dark earths and oils into the brilliant lights of our cities, and make electrical agents speed with our news, and plate our wares.

"Now, more than ever before," says Dr. Ray, in his work on "Mental Hygiene" (p. 16) "the fortunes of men, the welfare and happiness of the race are determined by mental efficiency. The time has been when the mass of the people had but little use for their minds. They had no occasion to think. A few favored mortals did their thinking for them. It was enough for them to do as they were bid. Stout limbs, stalwart frames, robust health were what the times demanded and what the times admired. A man was valued by the force of his blows, by the swiftness of foot, by his capacity for hardship. Now, these qualities will give him but a low place in the social scale, and secure for him but a small share of those privileges which constitute the highest kind of human happiness. Never before did so large a portion of mankind think. Never before did so large a portion of the race strive together for the prizes of life, in a contest of mind with mind."

War will be one of the first of arts to seek the aid of science. Whatever mechanics and chemistry can do to aid her murderous work will be sought out and pressed into service. Commerce also will ransack all the records of science for the means of competing in the supply of whatever comfort, vanity or appetite makes valuable in her markets.

BACKWARDNESS OF FARMERS.

Have the farmers as a class shared as largely as others in this course of improvement? Are they equally with others using mind in the operations of their calling, and so keeping abreast of the age in its advance? No class of men are of more importance to the State: no interest is so large as theirs. The statistics of Michigan for 1870, table 14, gives the occupation of 379,764 persons, of whom 187,211, or almost one-half, are agriculturists. The same proportion holds true of the country at large. On agriculture the wealth of nations must in the main depend, with all their commercial and manufacturing interests.

"Towns that are dotting ocean's shore,
The mountain slope, the inland vale,
Could flourish, populous no more,
If thy full granaries should fail." *

One department of agriculture alone advances with the progress of science,—its machinery; this is because it is less a part of agriculture proper than of mechanics, whose principles are known.

*Ode by Wm. H. C. Hosmer of Avon, N. Y., read by him at the Michigan Agricultural College Commencement, 1864.

As a matter of fact, farmers as a class have but begun the discussion of the question of Sallust. A few in each community think and read, a few either know the sciences on which agriculture depends or deplore their ignorance, a few are worthy successors of those Roman farmers of the soil, to whom the glebe, glad to be worked by men wearing civic or military crowns, yielded a large return.

But the prevalent opinion is that farming requires little of the knowledge to be had in the schools. "'Only a Farmer' expresses with all sufficient accuracy the relative position of farmers,—not their necessary, but their actual position. The occupation which should be a liberal profession is a most illiberal labor."*

ESPECIAL NEED OF EDUCATION.

There is especial need of educational work for farmers. Little comparatively has been done for them. A young man may choose out of hundreds of schools in which to study law or medicine, or the higher mathematics, or Greek and Latin. In these branches teachers and text books abound. Schools of civil engineering, even of mechanical engineering and mining abound, if we take account of the comparative fewness of the classes for which they exist. In agriculture here and there a school or a professorship struggles against deep-settled prejudices of community, and the inherited axioms of liberal education.

Again, farmers are isolated, there is not that sharp action of mind upon mind which disciplines to quick perception and logical thought the artisans of a manufacturing city. Information, improvements, reach them more slowly than other industrial classes. Again, mechanical works, making of railways, mining, manufactures, employ the masses of laborers under a skilled master, whose education in a sense suffices for all, while in agriculture, the advance depends upon the general progress of the masses themselves.

Besides, the business of a farmer is highly complicated as compared with that of a carpenter, a miller, a manufacturer. An apprenticeship that would fit a young man to compete with co-laborers in most trades would go but little way in fitting him to be a good farmer. Machinery is made according to fixed principles of action, that are simple and to a great extent known. Mechanics is so exact as to go by the name of applied mathematics. It is not so with the farmer's business. Quite a body of empirical rules exist; but underlying principles that would enable one to vary his practice from a knowledge of the relations of cause and effect are to a great extent wanting. Until these principles are ascertained, agriculture will be among the arts that have no fixed foundations in science. "To know *well*," says Lord Bacon, "is to understand causes." Liebig says "There is no profession which for its successful practice requires a larger extent of knowledge than agriculture, and none in which the actual ignorance is greater." Of all the pursuits of man, says Carey in his "Social Science," vol. 2, p. 26, "agriculture is the one requiring the highest degree of knowledge." The processes of nature in the production of plants and animals are hidden; plans cannot be made, giving in their execution exact predicted results, as a machinist can do. The routine found good in one place requires modification with the variations of many circumstances in another. It would certainly seem, therefore, that in no business would knowledge and mental discipline be of more service.

When a farmer understands the breeding and care of his cattle and the raising of his crops, there is other knowledge needful still. His business has wide relations to the affairs of other men. These he needs to understand. He should be acquainted with the laws of transportation, of trade, and of money. Ex-Gov. Seymour, of New York, in a late visit to the Agricultural College, told me that the Chesse Association of his place find it to their profit to have bulletins regarding the markets direct from London. In respect to this needed knowledge of political economy, farmers as a class are lacking. They are too apt to rest content with what they are told when they come to market, and too apt to plan with reference to the last year's profits only—to rest content in intellectual isolation.

Farmers as a class do not take the social and political rank that their numbers and importance entitle them to. There are about 6,000,000 persons engaged in agriculture in the United States. The census gives 41,106 lawyers. And yet Mr. Perry, the able professor of political economy of Williams' College, is reported in the papers to have said publicly that he could point out one hundred of those lawyers who have exerted more political influence in the State and nation than all the 6,000,000 farmers have done.

Consideration cannot be forced; it must be the outcome of genuine respect. Legislation cannot reach this case of social and political standing; education can.

There is another drawback to the farmers' business which education only can reach. The sons of farmers who acquire an education forsake the calling. The other occupations of life present more alluring prizes, great wealth, honor, and influence.

Were it not that education has generally meant abandonment of the farm, that an education which does not lead to other business is generally regarded, and by farmers themselves.

*Gail Hamilton's "Glorying in the Good," Atlantic Monthly, July, 1864.

also, as wasted; were it not that farming is often devoid of what gives it pleasantness and dignity, we might hope that many would seek an education in order the better to be farmers.

Professor Andrew P. Peabody, of Harvard University, says with truth: "To restore the deranged balance to society, its old honor must be rendered back to labor. Industrial pursuits must be raised in respectability and dignity above the lower walks of commerce, and fully to a level with its higher departments and functions. Both agriculture and handicraft must be made liberal professions. This can be effected only by stocking them with men of liberal culture, for it is not the profession that gives character and standing to the man, but the man to the profession. Our agricultural colleges and our industrial institutes," he goes on to say, "are supplying the needed culture, and are going to replenish the field and the workshop with a new order of large and high-minded operatives, men of liberal tastes, pursuits and aims, who will do honor to their respective callings, and make them seem worthy the noblest ambition of the aspiring youth of the coming generation."*

Who, looking over this fair peninsula, noting how largely farmers exceed any other class in numbers, and that agriculture is the mother of arts, can bear to believe that its ranks of farmers must continue to be depleted of the educated ones of their sons, that a social and political distance between farmers and those in professions shall grow up and widen, that the greater discipline and knowledge is to be usurped by the capitalists, and that agriculture is to remain longer stationary while all other trades are moving on.

The wide public domain, the facility afforded in a new country for acquiring ownership in land, the unexhausted riches of our soil, all put far off the evil day when large estates shall eat up the smaller, and the tiller, become the slave, of the soil. But without education among farmers, the processes of the old world will be renewed here. Out of their ranks the lawyers, capitalists, soldiers, are both raised and fed, only to look back upon farming as something happily escaped; to be praised and shunned.

NEWSPAPERS AND CLUBS.

No means of education can compare with the newspapers and periodicals. In the *Western Farmer* for Dec. 17, 1871, it is stated that there were but six agricultural papers in the United States in 1833. Now about one hundred agricultural papers, or an increase more than thirty times as great as that of our population, and well edited columns in other papers, spread amongst hundreds of thousands of readers their weekly, or monthly records of agricultural progress and experiments. So there were in 1833, but four agricultural societies in the United States. In June, 1872, 1,980 such societies and clubs, reported to the Department of Agriculture in Washington, and Michigan alone sent in the names of 58; and one has only to read the annual programme of such a club as the Volinia, ask after the discussions and experiments of one like the Roman, or secure a list of the lectures and papers presented to one like the Mason club, to be aware of their great educating influence. The strangers also, by discussing in their meetings, a still wider range of topics, embracing not only practical farming, but the relation of the business to the other industries of the world cannot but prompt its members and the communities they are in to set a high value on education. My purpose, however, does not lead me to dwell on these means of agricultural education, great although they be. The history of education shows us that the college is also needed. The scientific schools of the world, although the students in them form but a small proportion of the army of laborers in the business they teach, mining, engineering, designing, manufactures, still have had immense influence in furthering the arts. They are the head quarters of that scientific grounding and systematic presentation of principles and practice that must be found somewhere in every art and profession. Into this field, agricultural colleges are but lately entered, in this country at least, and I turn your attention to our own.

MICHIGAN AGRICULTURAL COLLEGE.

The Michigan Agricultural College does not stand alone. It is a part of an educational system, having as its head the University, especially in its highest sphere, as a school of literary, philological, philosophical, and scientific knowledge, in their purest forms and highest elements. Below this stand, the professional schools, law, medicine, and, as I conceive, no way inferior in rank, the Normal School, the Agricultural College, the schools of engineering, mining, pharmacy, and whatever else may either at Ann Arbor or elsewhere educate chiefly for some designated business in life. Then comes our Union Schools and our primary schools, in the popular sense. The system is one. Jealousies are nowhere more out of place than in the members of such a household, and, I believe, have no existence. Each one has a deep educational interest in the highest prosperity of all the others.

ITS SPHERE.

Happily, therefore, we in this State are relieved of many of the questions that perplexed

*Smithsonian Report, 1872, p. 194.

other States in managing the national grant of lands. In Illinois and New York it went to found universities like ours at Ann Arbor, with an Agricultural Department. But in this State the existence of the best university of the West, affording a variety of courses of study to the choice of students, classical, scientific, scientific with Latin, or with Greek, or with modern languages, with schools of law, medicine, pharmacy, civil engineering, mining,—this narrowed at once the field that the Agricultural College had to occupy.

SCHOOLS OF TECHNOLOGY.

Incidentally I give it as my opinion, that aside from the labor system there was no occasion for an institution separate from the university; but that the education of farmers imperatively requires manual labor, and such separation. If this be a correct view, I would supplement it by saying that no branches of a Technological School, which cannot harmonize with this labor system, ought to be connected with the Agricultural College. I should deem the interests of agricultural education imperilled by such extension.

LADIES.

I am strongly in favor of adding a department for women, and can see no reason why such a one should not be useful and successful. Our limited experience has been in favor of the plan. Several other institutions report classes of ladies in horticulture and other branches. Could we accommodate the ladies who apply for admission, they might receive technological training in the application of chemistry to common household arts. Such applications are cooking, preserving of fruits, utilization of materials usually wasted, cleansing by acids and soaps, bleaching, dyeing, manufacture of soaps of different kinds, disinfection, fermentation, neutralization of poisons. A course of lectures on dairying is already given each year by the professor of agricultural chemistry.

AGRICULTURAL.

But whatever departments may hereafter find a place here, the college has endeavored to be truly and emphatically agricultural. With its limited means, any additional school would have been poorly provided for. Besides, as a school of agriculture, it is yet far from perfect. A wide spread distrust of it as a probable center of book-farming, a disbelief amongst a wide class of the better educated in all attempts to return a man from a college to a farm, the annual appeal for assistance from the State, all together, have compelled to a system of bestowing on the college an amount insufficient to carry on any technological school of high merit. The intention of successive legislatures, that of 1873 excepted, has been to help it simply to live until its fund should support it. Estimates for the purchase of stock, or implements, or books, or for a professorship of chemical physics, of mathematics, or of mechanics, and surveying, and rural engineering, or of political economy and history, or of geology, or veterinary, are reduced to a minimum or generally stricken out altogether before applying for aid.

I do not complain of this, I only state it. But it was hardly worth while to enter on new fields before the one we cultivate has put on the comeliness of vigor and healthy growth. In every vote in the House in previous years, more farmers have voted for the college than against it, and the college hopes through the efforts of farmers and all interested in education, to become just what is needed as a professional school of agriculture, and then to have their hearty confidence and support.

GROWTH SLOW.

The growth has doubtless been slow. Professors of agriculture, agricultural chemistry, and horticulture had to be made, or rather in the face of adverse criticism, with every failure through inexperience open to the world to make themselves. Text books were not. The schools were filled with teachers who, coming from other institutions, turned their pupils' ambition to the halls they had left. The course, devoid of classics, crowded with science, compelling to manual labor, and long, was repulsive to many. And I have known students coming to college in the spring, hearing of doubts as to whether appropriations would be made, to determine that they could not afford the considerable expenses of starting out in such uncertainties, pack their goods and return to their homes.

COURSE OF STUDY.

The course of instruction at our Agricultural College should be such as to make good farmers, or at least put the students and graduates in the way of becoming such. Let us turn our attention first to the indoor course of instruction. I believe the law is right in its requirements for admission. This is as follows: "No student shall be admitted to the institution who is not fifteen years of age, and who does not pass a satisfactory examination in arithmetic, geography, grammar, reading, spelling, and penmanship." These branches

are not taught at the college. The common schools of the State can carry forward the education of young men so far. To put the standard for admission higher would be to exclude many from the halls of the college who have no means of carrying their preparatory education any higher. As a matter of fact, the average age at admission was (1874) 18½ years, and the larger part of the freshmen had some knowledge of algebra and other branches. The requirements for admission might be increased with the increased efficiency of our common schools.

PURELY PROFESSIONAL.

Shall the course of study be purely professional? Such courses seldom exist in any school. Take a medical course of study, and its chemistry belongs to manufactures as well as medicine; its anatomy and physiology are no part of medicine. Huxley studies them not to practice, but to classify the animal kingdom, and Spencer and Bain make physiology the introduction to mental science. Technological schools usually teach sciences as well as their applications, and the modern languages.

But it may be thought that while chemistry, botany and the like lie closely enough to the proper fields of an agricultural education, literature, political economy and the like are too remote from its objects to have a place in such an institution as ours. Let me quote to you the eloquent words of Mr. Williams, the first president of this institution: "A farmer is a citizen, obliged to bear his portion of public burdens, amenable to the laws, and in a humbler or a wider range, may become an exponent of society. He should be able to execute, therefore, the duties of even highly responsible stations, with self-reliance and intelligence. The constitution of the Union, and of his State, he should comprehend, and the laws and forms relative to township and county officers and their duties. He should be qualified to keep farm accounts, draught ordinary instruments, survey his farm, and level for drains and highways. His native language should be a flexible instrument at his command, which he should speak and write with ease and vigor, that he may instruct and impress others, avert mischief, or inculcate truth. A man moved by earnest reflection or deep emotion, should have capacity to give them utterance and force in his mother tongue."

If these studies then are highly desirable, if the awakening of a taste for history and other reading, the elements of political economy, correctness and facility of speech are requisite to the education, why should they not be taught at the Agricultural College, if they are given their proper place as subordinate to the special studies that are peculiarly appropriate to the course? They cannot be taught much more cheaply anywhere else, for our classes could be joined to no classes in other colleges without an increase of instructors.

Unless these studies are taught at the college, its students will not have them at all. It is useless to talk of their going to other schools to learn these things. Young men, unwisely, as I believe, take the shortest road to entrance on their life-business. You have only to open catalogues of law and medical schools to see how few are marked as having completed any course of study preparatory to their professional course. Taken altogether, it is scarcely more than one in ten. If, then, students will not take a preparatory course for a short curriculum into the learned professions, all whose traditions favor erudition, they are hardly likely to do so for our longer course, in order to reach a business where an education is commonly thought to be thrown away.

THE LAW.

This wider range of study is in accordance with general desire and the law. The usual address of President Williams, the law organizing the college, the law of re-organization, the various addresses and reports of similar institutions in the country, all agree in recommending this wide range of study.

LAW OF CONGRESS.

The law of Congress "donating public lands to the several States and Territories which may provide colleges for the benefit of agriculture and the mechanic arts," provides that the interest of the fund "shall be inviolably appropriated * * to the endowment, support and maintenance of at least one college, where the leading object shall be without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts, in such manner as the legislatures may respectively prescribe, in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions in life."

LAW REGARDING STUDIES.

The law of this State—submitted by a farmer to the Senate in 1861—is still more full. Its provisions are as follows:

"The State Agricultural School * * shall be known by the name and style of 'The State Agricultural College;' the design of the institution, in fulfilment of the injunction of

the constitution, is to afford thorough instruction in agriculture and the natural sciences connected therewith: to effect that object most completely the institution shall combine physical with intellectual education, and shall be a high seminary of learning, in which the graduate of the common school can commence, pursue and finish a course of study, terminating in thorough theoretic and practical instruction in those sciences and arts which bear directly upon agriculture and kindred industrial pursuits. The course of instruction shall embrace the English language and literature, mathematics, civil engineering, agricultural chemistry, animal and vegetable anatomy and physiology, the veterinary art, entomology, geology, and such other natural sciences as may be prescribed, technology, political, rural and household economy, horticulture, moral philosophy, history, book-keeping, and especially the application of science and the mechanic arts to practical agriculture in the field. * * A full course of study in the institution shall embrace not less than four years."

The course of study has been made to meet the requirements of the law so far as its limited means allow. At the same time students are received for instruction in such studies as they shall select, so that virtually there are shorter courses.

SCIENTIFIC STUDIES.

The sciences have a place very properly in professional schools. The student not only desires to know what to do, and how to do it, but also why? The mind prompts to the inquiry after the reasons, so far as they are known, and to speculation where actual knowledge is lacking. Out of this curiosity science arises and is furthered.

The surveyor studies geometry, although he could do ordinary surveying as most persons do, without understanding it; the navigator usually manages his vessel according to rules, but he would often be more competent to his work if he understood astronomy, trigonometry, and physical geography.

It has sometimes been doubted whether agriculture is yet well enough understood to make a knowledge of the sciences of chemistry and botany and vegetable physiology of any great value to him. We know how to do many things, do we know why? We understand the value of rotation of crops in general culture. Does chemistry throw any light upon the reasons? It must be owned that the causes at work in agricultural operations are mostly, as yet, mysterious in their working, and that agriculture is but barely entitled to the name of a science. To know what to do and how to do we have to look away from the sciences to the practice of those who are successful farmers. We may visit and talk with them upon their lands, we may see their communications to the papers, we may take the treatises in which the rules of the art have been collected and classified, and it is only by these methods that agriculture is to be learned.

Still the sciences have their uses. It is the desire of thoughtful men to investigate the conditions of growth, and to change the condition of agriculture from that of an empirical art into the nobler one of a science, founded on known principles. They only can aid in this work who have a knowledge of the several sciences out of which agriculture comes.

Agriculture as a routine practice changes. It is not East what it is West. It calls for modifications according to variations of climate, of implements used, of the demands of the markets. One whose knowledge is purely that of routine might be a model to-day, and in the back ground to-morrow. A knowledge of science will enable the farmer to understand the discussions that are going on. The unscientific readers of papers, however generally intelligent, cannot understand these discussions if they involve any accurate knowledge of the sciences. But with such knowledge he can keep up with the discoveries science is making, and find out their applications to his business. A young man who has made the technical terms and principles of any science familiar to himself has received the best of training in the art of observing, comparing, thinking. His present knowledge consisting of general facts in systematic arrangement, becomes the nucleus about which all he sees, or hears, or reads gathers in orderly array. Modifications in his practice are more easily adopted by him than by his neighbor who does not think.

But even now, science has taken so fair a hold of agriculture that a knowledge of botany, animal and vegetable physiology, entomology, chemistry, meteorology, and mechanics are of essential service to the thoughtful farmer. The relations of fertilizers to vegetable growth are beginning to be known, and chemical analysis to be profitable, and some light has been thrown on fattening processes, the action of soils upon soluble substances, and a variety of other things. Especially are new facts being elicited which admit of classification and useful application, and even now it will be found that scientific knowledge is one of the most valuable aids to the farmer. Science has always vindicated its practical nature. The astronomy that Socrates thought useless, rules the navigation of the world; the "swing-swangs" that were ridiculed in Hooker's time gave us the clock, and what seems more remote from our telegraphs than Galvani watching the contractions of the leg of a frog? Nothing is more practical than science.

For the continuance therefore of his education, but just begun at college, and for his best service to society, the student should be well trained in science. But neither student nor teacher should ever forget the agricultural aim in view. The teaching of the sciences should be saturated, as it were, with the agricultural element, with illustrations drawn from the art, and constant applications of principles to the business of the farmer.

In brief then, the college should impart to the young farmer the elements of such instruction as makes a man and a citizen, should ground him in the sciences on which agriculture depends, should indoctrinate him in the best existing rules and practice of his art, should make him alive to its needs, acquainted with the theories, discussions, and experiments going on for its advancement, and fire him with enthusiasm to place his business on a par with those in which skill, intelligence, and thorough scientific preparation receive on all hands a due appreciation.

APPLIED SCIENCE IN THE INSTRUCTION.

Practical agriculture is taught as an art, based on experience. The question asked is, what method of management will yield the greatest profit without the impoverishing of the soil? For an answer it goes to the best farmers of the neighborhood, the State, the world, and critically examines how they do. It takes account, of course, of climate, market, cost of labor. It attempts also to give the scholar a wider than a one year's view. It may show that a root crop that does not pay so large returns one year as another in its place would do, may repay in the end, if labor can be put upon it, in the oxidation of the soil which its frequent stirring has promoted, or by the eradication of weeds. It may ask the student to try the effects of a mixed husbandry for a series of years with a succession of sudden changes, as from sheep to hogs.

The instruction in given in a series of daily lessons for one half year, and another series of three a week for another half year. Lectures are sometimes given in the fields and barns. The farm now, for the first time since the students received it a wilderness to be cleared and subdued, furnishes an illustration of well-shaped and partially drained fields under a system of rotation of crops. The summer beauty of the farm, its almost entire freedom from weeds, its respectable crops, have elicited high praise from the farmers who have visited it. The stock, which a few years ago was wretched, has become good through a system of a sale of a few inferior for the means of purchasing a better animal.

The operations of horticulture, entomology embracing bee-keeping, the practice of drainage, of surveying, are all elucidated in lectures.

Agricultural chemistry comes in with its course of a half year's daily lectures, and includes dairying, and many other things less treated of in practical agriculture. From a new point of view it reviews much of the ground that practical agriculture goes over. Vegetable physiology, in charge of the professor of botany, does the same. We have as it were, three professors of agriculture, each in his separate field of labor.

Lying back of these is the science of chemistry in its purer form,—a course of lectures for a half year followed by three hours of daily work for another half year in the chemical laboratory, and by a half year's daily lectures in chemical physics and meteorology. By a half year, I mean an hour daily five days in the week for half a college year, which year is the same length of time with us as at the university, and at colleges generally.

Similarly botany, vegetable physiology, anatomy, physiology, entomology, geology, lie back of other instruction. Surely our course of study, considered as a whole, is sufficiently distinctive, and holds sufficiently close to the governing idea of an agricultural education.

The older institutions certainly show that little is to be hoped from them in the way of educating young men to be farmers. The department of agriculture in colleges and universities have not succeeded in obtaining students. Suppose that an experiment has been tried here which was found to increase the proportion of educated men that go to farming nearly forty-fold, would one not think that farmers would look upon it with favor and some pride? This is what the college and a few like it have done; they have made educated men to be good farmers in forty-fold greater proportion than any or all other colleges, and yet it hangs in doubt each two years whether a legislature of farmers will permit it to live or abandon it to die. Established primarily as a school for instruction, as a reading of the laws and discussions will show, it is looked upon with disfavor because it fails to do as rapidly as some farmers have hoped, some other things besides educating young men to be farmers.

THEY LEAVE THE FARMS.

Out of school like this will any graduates return to the farms? Does not manual labor seem ignoble to one whose early youth is given to the acquiring of knowledge and the discipline of mind? Will not the habit of hard and daily manual labor be over-difficult to attain after several years of its disuse?

From almost every quarter the answer comes that it is of no use to try. The prediction flew

abroad that not one graduate in one hundred would ever work. Shortly the prediction took the form of a fact, and the newspapers reported that as a fact which was only what everybody predicted. You may read it now in the papers and journals from one end of the country to the other. The graduates, they all say, are not farmers. The schools are all failures.

I am sorry that farmers have joined this cry without waiting to see. For, look you, how dark is the picture? Had it come from examination of facts we might say the schools have been wrongly manged, but when it comes from an expectation, and is held to in spite of facts, it shows what the world thinks of labor and of farmers: that the one and the business of the other is in some way inconsistent with a high education.

This is the way the case was put two years ago in a communication of an educated man to a paper of this State. He says the college is a failure because "nineteen out of every twenty who graduate there never follow agricultural pursuits." He assigns a reason: "And why? Because when a man's brain is educated up to a point where it can provide for the wants of the body without muscular aid it will do it every time in spite of all the sophistry and poetry which can be thrown around the life of toil of a farmer."

This is a gloomy reason that forever confines farming as a business to an illiterate class. It is a reason that debars progress forever, and puts a distance forever widening between farmers and others.

THE REMEDY.

The remedy for this abandonment of the farms is not easy to find. Gov. Seymour of New York, in a long conversation with me, endeavored to impress on my mind the necessity that young men should learn how to make their homes attractive by inexpensive landscape gardening, planting of trees, arrangement of shrubs, and the like. He showed by full illustrations that rural taste survives, and affords a genuine pleasure to extreme old age. Others dwell on the necessity of that intelligence and culture among farmers that shall insure them a higher social position.

COMBINING LABOR AND STUDY.

It seems to me that there is little hope of returning students from a college to a farm in any considerable numbers, if they are permitted to pass their college years without manual labor. I think I see in the retaining of habits of daily manual labor, in the interest which studies and labor may be made to shed upon each other, the beginning of the remedy for this abandonment of the farm by young educated men. It certainly does not lie in the fact that the occupation of a farmer does not afford scope for thought, and a field for the employment of the largest fund of knowledge. Except in the more constant contact with other men, ordinary trades and manufactures and commerce offer no such delights for the man of taste as those that the farmer is privileged to enjoy; the labor is not harder, and is more varied; and the profits compare well with the average returns for any kind of labor. But labor has not received due honor.

Man is the creature of habit, and the customs of the world are against receiving an education and then farming. The college has tried to withstand these tendencies, and one of its best means is its labor system.

COLLEGE LABOR SYSTEM.

The following are the principle features of the labor system as existing at the Michigan State Agricultural College:

1. All the students labor, except when exempt on account of physical disability. This is the requirement of the law of the State, which also prescribes the time,—three hours daily,—as a general rule. I attach much importance to this rule. The agricultural colleges of Maine and Iowa have nearly similar provisions. Massachusetts requires six hours manual labor a week, excepting however one-third of each year, and still one other third of the senior year, when no labor is required. The other colleges require no labor, but several of them furnish it when applied for. It is sometimes asked why it is not as well to let students labor or not as they may choose. So far as the labor is requisite in order that they should know how to do things, they might as well be excused from the practice of surveying, and of chemical analysis, as of farm and garden work. Very much they can indeed learn at home, if they come from farms;—some do not come from farms;—and many things are done here that may not be done on ordinary farms.

But there is much in the atmosphere of a place that determines the habits of those that resort to it. Certain colleges are noted for certain characteristics of its students. If a student goes into a college where almost none work, he will be apt to do as others do, if he can. If the general aspect of the institution is one that looks toward the professions and literature, the ordinary young man will turn his face and bend his steps in the same direction.

An agricultural college should exert a different tendency. For this reason it should be

separate from other schools where labor is not required. Labor should be demanded of all that its good influences in maintaining habits of daily labor, taste for rural pursuits, and imparting skill, should be general, and create the proper feeling towards it, in all who are connected with it.

I believe this object has been accomplished at the college. I listen to the orations of seniors and juniors who are permitted a large freedom in what they advocate. I mingle with them at their work, and I have never known students study books in any institution with greater general faithfulness than they labor here, and the way of speaking of labor is appreciative, and honorable alike to students and the institution.

2. The regular hours of labor are from one to four o'clock each afternoon, except on Saturdays when it is furnished only on request. As a matter of fact, five-sixths of the students do request it. This arrangement leaves the entire forenoon for study and classes, and gives time for complete rest after labor before the study of the evening.

Some years ago the students were divided into three divisions, the first division going to their work immediately after breakfast, a second division at the end of three hours, and a third in the afternoon.

The present plan gives a better part of the day to study, when the mind is fresh. Three hours' work, which a mature man would not mind, is a tax on the vital energies of an immature, growing boy, that is apt to render him sleepy or inert afterwards. The plan enables us to work the boys more in groups under proper leaders and officers. Some of the students are unaccustomed to work, many are young, and it is essential to their good habits, as a general rule, here as in everything else, that they do their work under the lead of some one who knows how to do it. The arrangement of lectures and work under this system is more readily made.

The change was made years ago. It was explained to a committee of the House of Representatives, and the additional cost of the plan was shown. It was approved by them, and by many succeeding committees, and has worked with us much better than the other plan.

3. The officers of the college work with the students, and personally superintend the work. It is a matter of my personal knowledge that the professor of agriculture, and the professor of horticulture go out to the three hours daily work with quite the same regularity as the students, and stay through the three hours. There are besides, two foremen on the farm, both excellent practical farmers, and a foreman on the gardens; and the foreman of the greenhouse, when not needed within the house, always works with the students outside. All these are part of the educational force of the institution. It is in this oversight and leadership that the pupil finds it to his educational advantage to work. To one who looks upon the college chiefly as a farm, and the students as so many hired men, this may seem a waste of force, but to any one acquainted with the demands of education it will not appear so. Efficient schools are those that are well supplied with competent instructors. The University has four professors and instructors in chemistry, and has I am certain none too many. Our farm is a large laboratory, where the students are scattered out of sight of each other, and busied with more various processes than go on within the walls of a chemical laboratory, and we too have none too many to look after the working habits and instruction of our pupils.

4. The labor of students is intimately connected with the subjects of their lessons. Lectures are not infrequently given in the fields, or yards where the stock is kept. The principles learned from books find their illustrations in the field or workshop; and on the other hand, what students observe while at labor stimulates them to the study of principles.

While the freshmen and seniors alternate between the farm and horticultural departments, the sophomores work the entire year on the farm, and the juniors on the garden. This gives the superintendents opportunity for somewhat of a more systematic instruction in the two departments, and enables the students to keep informed of a whole years' continuous plan in the two departments.

The teamsters employed by the month do not labor where their work will forward farming operations most, but where they will make best preparation for the students' labor, and the labor of students is very varied. They help take care of the stock, they milk and feed the cattle, drive the teams, run the machinery of different sorts, plant, tend and harvest crops. Scarcely anything is regularly done by the hired help, except the main charge of cattle is with the herdsman, whom the students assist, and the care of horses is with hired men chiefly. The improving work is done in good quantity by the students themselves, and especial care is taken to make the labor various. Students are not kept at the labor they can do best, but are changed from one kind of work to another. Besides these farming operations they do surveying, and platting, they graft and bud, they often have special plats of some vegetables under individual charge, they repair tools, and make fences and gates. They lay out and construct drains and repair buildings. The piggery is almost entirely their work, so is the inside work of the horse barn, and the fitting up of the windmill.

Such a system as this differs essentially from that of a simple manual labor school which (as is often stated) have always been failures.

Do students shirk their work? But very little. Never more than students are accustomed to shirk lessons here or elsewhere. Most of them are accustomed to work on entering; most of them need the 7 or 7½ cents an hour allowed for faithful labor. The variety of kinds of work, the relation of it to their studies, the presence and interest of their instructors, serve to interest them in what they do. The best scholars are usually the best workers.

DOES THE LABOR OF STUDENTS PAY?

Pay how? or what? This is a college, and everything pays that is not too costly as a means of illustration, or of instruction, or of securing skill in the matters it is designed to teach. A college buys large museums to aid the student in his study of geology, or zoölogy, or mineralogy, and the expenditure pays by furnishing means of study. So with the chemical laboratory, the library, etc. It is the same with the botanic gardens, the varieties of stock, fruits, nurseries, vegetable gardens, farm crops, implements, meadows, pastures, and all the furniture of a college like this. They "pay" by being means of illustration, complementing the lessons of the text books and lectures. They pay by being a place on which he practices what he is afterwards to do.

Since a chemist's knowledge is more accurate after he has had practice in the chemical laboratory, therefore, here students work a half year in the chemical laboratory, three hours a day, after they have had their half years' course of chemical lectures. The surveyor's knowledge is more to be relied on, if he has actually used the compass and level, surveyed lands, calculated contents, and made plats. Students receive such practice here. In the same way they have practice in grafting, transplanting, the use of farm and garden implements, and in the manual operations of farm and garden. The college thus imparts the practical knowledge it was established to teach. If the labor teaches, gives familiarity with mechanical, botanical, horticultural and agricultural principles, and bestows practical skill, so far as such a limited exercise as three hours work a day in varied labor can go, in so far it does pay like any other expenditure for sustaining an educational institution.

IS THE LABOR SYSTEM EXPENSIVE?

The labor system is, of course, not without its expense to the institution. Tools and teams are required in greater numbers than a farm of equal size requires, especially as almost all the students work at one time. Three hours labor of a boy varied to give him instruction is not worth so much as a third of nine hours of continuous work applied where it would be most profitable. It is limited also to a set time; and ends, unless great loss would accrue, irrespective of the condition of the work. Besides, labor has to be planned for a large force for three hours, succeeded and being succeeded by a very small one. To make the labor educational requires also the constant superintendence of skilled professors and foremen, who must be paid.

ALL EDUCATION COSTLY.

But all education is costly. No student in a public institution of learning pays his expenses. Buildings, libraries, museums, laboratories, instruction, are all the free gift of communities or individuals to the student. Technical instruction is costly. And if the expense of our labor system be reckoned up, and taken as educational, it will not be found to be more expensive by the hour than chemical, mining, mechanical instruction usually is.

WHY PAY WAGES?

The college is sometimes compared with a medical school or a law school, and it is asked why we should pay for what the students need educationally. The cases are not similar. In a medical school a student hardly does more than try his hand at dissection; he may plead a case or two in a moot court. But with us labor is a daily thing; it is three hours at a time, and it is valuable to the institution. If you count in the expenses of carrying on the labor system, the wages of the foreman, the interest in additional tools and the like, students' labor are no profit. So if you count the antecedent expenses without which dissections and moot courts could not be, they may be found to be expensive. But if these are counted among the necessary expenses of the college as an educational institution, as I believe they should be, then the labor of students is worth to the college all we pay for it. It is continuous productive labor. I think a student in a laboratory who earned something every day from year to year by his analyses would desire a share of the profits. The plan of paying wages is quite general, but not universal, with the agricultural colleges.

When the institution was first started, 16 cents an hour was paid as the highest wages. President Williams, in his first report to the board, April 1, 1858, says of the college: "A

paramount object is to enable the student to support himself by his own labor while acquiring his education," and he adds "Whether the student by three hours' labor in summer, and two and a half in winter could board himself is not sufficiently tested, nor can it be till the farm is thoroughly subdued." I think he was convinced that the students' labor would not enable them to pay their board, for before he left he suggested a plan to the board. This was the plan afterwards adopted, of having the long vacation in the winter, so as to afford students an opportunity to teach.

Subsequently, wages were still further lessened, as it was thought the labor was of more value to the students educationally, until the maximum wages now are eight cents an hour, for the regularly required work of students.

GOOD EDUCATION AT SMALL COST.

The winter vacation, the small wages received for work, the plan of boarding at cost,—a requirement of law,—does place an education in this institution within the means of many who could not or would not otherwise furnish it to their sons.

Many students pay in but about \$70 a year to the college, and many of them still less; some of those who work Saturdays have only from \$45 to \$60 to pay in for a year of board and instruction and all college dues.

EXPERIMENTS.

To experiment for the sake of discovering knowledge, and to teach, that is, to impart existing knowledge, are distinct things. Both are necessary, in agriculture, as in other arts of life. They are not necessarily connected in an agricultural college, for the larger number of agricultural colleges have no farms for field and feeding experiments. Most of the European experiment stations of Europe have no college in connection with them. Doubt has been expressed whether instructions and experimenting can go well together. Thus Professor Hilgard, late of the University of Michigan, now of California University, says: "It is my opinion that in not a few instances the educational interests have suffered by being subordinated, or even too closely co-ordinated with to the experimental work." (*Progressive Agriculture*, page 25.)

In my opinion, experiments should be conducted every year at our Agricultural College, and a little farther on I will endeavor to show why. But at present, I ask which purpose is the main one, experimenting or instruction of students. To say that one purpose is the main one, is not, of course, to say that the other is not of very great importance; but if one purpose is comparatively the main one which is it?

If we can judge of the various enactments of Congress and the State the college is primarily one for instruction of students; the debates in Congress and in our own State, the addresses made at the opening of the college, the example of other institutions, all indicate the same. The good to be expected from it is primarily the theoretical and practical instruction of students. Medicine is a science whose underlying principles are but little better known than those of agriculture. There is abundant need, and abundant opportunity for original investigation in the healing art. But from its schools we look first for education of young men in medicine. In civil engineering much original investigation is still required. The strength of materials, the laws of fluids flowing through channels, and other subjects afford abundant room for experiments, but from the schools of civil engineering we expect primarily the making of civil engineers, capable of using what knowledge there is to be imparted in the science. Keeping up with the advance of knowledge in any department, giving instruction to classes by lecturing, superintending practice is considered usually a sufficiently laborious work for a corps of professors in any institution, and the world is glad if here and there one takes upon himself to add to the sum of human knowledge.

Nothing was more natural, however, seeing the many problems that agriculture presented for solution, than to hope that the union of professors, laboratories and farms might result in a rapid advance of the art, and the speedy establishment of its principles. Such expectations, however, were opposed to the whole history of the advancement of science. Its growth is slow, and I hesitate not to say that more is often hoped for from a single college in a few seasons than all the colleges of the earth could accomplish if they tried nothing else for the same time.

ROUGH EXPERIMENTS.

Experiments may be divided for my purpose into two kinds. The first I shall call "rough experiments." They are such as have determined that dent corn can adapt itself to our climate, that osage orange will make hedges in Illinois prairies, that sorghum is not profitable as a sugar-making plant with us. These and many other results have been gained by repeated trials made by enterprising farmers here and there, who have read of some one else's success and have risked the trial for themselves. The peculiarities of a soil, or a sea-

son that make success or failure, are eliminated by the repetition of the trials, until at last a settled conviction pervades community regarding some things, useful to be known. By such trials and the observation of skillful, practical men, the practice of farming has grown into its present shape.

More will have to be done in the same way. New crops, new varieties of old ones should be tried. And the more frequent the trials, the more exact the detail of the practice, the more intelligent the observer and operator, the more valuable will be the results of these rough experiments.

So many circumstances enter into an experiment of this sort that the college can hardly try one for the farmers. It must rather be only one of several who try the experiment. For the climate of Central Michigan differs from that to the East, or West, or North. Soils vary, and an experiment tried here would have to be tried also in other localities before it would settle the value of any seeds or practice.

This, too, is not an age when diplomas and colleges impose on men. They listen as willingly to George Geddes, and "Walks and Talks," as to the professors of Yale or Harvard. So far as one experiment of this sort goes, an enterprising farmer can try it as well as we. The college should help in these, because it should join in whatever helps forward the progress of agriculture. But, perhaps, more rough experimenting could be accomplished by a small appropriation to, say, a half-dozen vigorous farmers' clubs. The libraries, apparatus and professorships of the college look to other purposes in addition to taking a proper share in these rough experiments.

EXACT EXPERIMENTS.

The other class of experiments I shall call "exact." They do not differ in kind from the rough experiments, but only in the care with which every element is observed and recorded.

The aim of the scientific experimenter is to ask of nature, so to speak, one question at a time and only one; to put the question clearly, and take the answer exactly, adding no inference of his own. He may infer, he will do so no doubt, but the inference is his gratuity,—each man may add his own. In all sciences this questioning is a matter of extreme difficulty. "Rightly to question," says Lord Bacon, "is the half of science."

In agriculture, exact experiments are of extreme difficulty, and can almost never conform to ideal tests.

President Hitchcock, of Amherst, said he had been trying experiments in chemistry for twenty years, and added, "I do not know of any so delicate as the farmer is trying." Liebig says: "When the practical man does attempt to apply scientific teaching he is almost invariably a sufferer. He seems altogether to forget that man does not become intuitively acquainted with scientific teaching, which, like the skillful use of any complex instrument, must be learned."

These difficult experiments seem to be easy, and invite trial at incompetent hands. And so Appleton's Cyclopædia says truthfully: "In agricultural reports and periodicals are thousands of reports on the value of manures, with most conflicting statements and a chaos of results." The Hon. Amasa Walker, the distinguished political economist, who, as Secretary of Massachusetts, collated the agricultural returns of the counties of the State in 1851, said "They are all chaos, they do not prove anything."

It is upon accurate experiments that agriculture must depend, for a change from an undeveloped art into the standing of a science.

Exact experiments demand a large outlay of money. Lawes & Gilbert have spent \$15,000 a year in field experiments that have almost uniformly borne good crops. The universal testimony of those who undertake these investigations is to their costliness. Such experiments come slowly to their results. They would weary out those who wait for results. Bussey Institute, the Agricultural School of Harvard University, with its farm and seven professors, is prosecuting admirable field experiments. Some seventy experiment stations in Germany, Chambers of Commerce in England, George Ville in the Jardin des Plantes of Paris, Mechi, Lawes & Gilbert, Johnson of Yale, and all the experimenters of the world, would no doubt feel well repaid if the combined efforts of all together could elicit one new fact, and firmly establish it, each year. They will altogether fail of so rapid progress. "It takes ten years, at least," says President Clark, of Amherst, "to establish one agricultural fact."—Mass. Agr. 1872-3, p. 182.

Accurate experimenting taken alone does not serve as an illustration of farming. The results come too slowly to the student; he needs the example of ordinary good farming before him, where the results appear from year to year.

TO BEGIN WITH THE SOIL.

Dr. Thomas Anderson, the chemist of the Highland and Agricultural Society, who has been an authority in experimental agriculture for many years, lays it down as a rule in accurate experimenting, that the field to be used should be divided into plots, treated exactly

alike over its whole extent, and the growth and produce of each plot separately examined for two years before the experiment upon it begins.—Agricultural Transactions of Scotland, 1861-5, page 116. Then for the effect of one manuring you must wait several years, and repetition then is requisite. I give, as an example, a case taken from the New York Weekly Tribune for Feb. 10, 1875, where a man burned a quantity of brush on sod ground. A corn crop, an oat crop, and one clover crop showed no effects, but the third year the clover stood double on the portion where he had burned the brush. The writer pertinently asks, "Had I applied a different kind of fertilizer on my clover, would not the last applied have been likely to receive all the credit?"

I cannot go farther into the discussion of exact experiments. But I hold that those experiments that are to give us a science of agriculture must be left to skilled and scientific hands. Ville must be allowed to grow his plants singly in bottles. Liebig, Boussingault, Lawes, must each take the field he sees himself adapted for. I believe these are the most important kind of the two for the college to work at. The results may be more slowly reached, but they are of more permanent and general value. They require also a professional skill, chemical analysis, means of accuracy that the ordinary farmer cannot command. Is it not best to free institutions that can try these experiments from any over burden of the rougher kind that are within the means of many?

I should regard highly the criticisms of good farmers on our general farm management, our stock, our implements, and on rough experiments. But I believe I do them no wrong, if in the matter of the nice field and feeding experiments we have endeavored to try, I look rather to the verdict of Joseph Harris, who was once associated with Lawes and Gilbert, and is a good chemist and practical farmer; of Professor Johnson of Yale, and some half-a-dozen others who know the requirements of strict experimenting; if I believe with Liebig that professional skill is here required. I know that these men, that George Geddes, that Lawes and Gilbert of England, have taken a deep interest in our experiments, and have praised them highly, as exceptions to the general indefinite experiments that usually are made. I believe that the State has just reason to be proud of the position the college has taken in this matter, as it has in its establishment of a successful school of agriculture. You will find that the good fame of the Agricultural College has gone hand in hand with the rest of the fame of this State for success in promoting a high and widely diffused education.*

COLLEGE MUST EXPERIMENT.

Although experiments are not the main object of the college, yet they are a very important object. There are abundant reasons why we cannot afford to do without them.

That the progress of science is slow excuses no one from efforts to further it. Rough experiments it should do to some extent, because it should help along and illustrate all the movements that aid farming, and because at slight additional cost it can perform them. But it should particularly show examples of that rigid experimenting which is costly from minuteness of care, and valuable in proportion to its extreme exactness. It ought to possess the means and skill for teaching the determination of questions to the utmost attainable degree of precision, so that its graduates and students may go out qualified to help agriculture to become a science.

Not that these same graduates in their farm experiments would be as minute, generally, as the example given them. But they would be more exact, would understand the conditions present, and of those lacking more accurately, and interpret the results more consistently with the conditions of the experiments. Field and feeding experiments enough to afford ample means of study, and excite enthusiasm, as many, indeed, as the limited means of the institution admit of, should be carried on. The rest of the farm and stock would afford illustration in study, and serve, as I shall by and by show, another indispensable purpose.

In such experiments the college has already shown its skill. Great pains was taken to make the experiments exact. There has been debate as to comparative value of small and large plats; most exact experimenters using small ones. We have combined the advantages of both large and small plats. Eight small plats fertilized with bone dust make quite a field taken together, and are in the aggregate no smaller because interspersed with eight of Berry's superphosphate, and eight of Baugh's superphosphates, and still more of plats unmanured. The intermingling of one considerable field with another, like the black and white squares of a chess-board, reduces the error of inequalities of soil which mere sight and handling cannot detect.

Although for reasons that seem sufficient to the honorable board of experienced farmers and others that have the college in charge, these experiments have been suspended for a few years, the college is ready to resume them, and must do so for educational, if no other purposes.

* I take pleasure in appending to this address, a letter from Joseph Harris, dated Feb. 26, 1875, regarding the exact experiments of the college, and a list of the published experiments.

Again, a deadening influence would fall on faculty and students if we had no experiments. None are qualified for the high office of instructors in science who are not in spirit investigators also. Truth-seekers are a brotherhood, and although scattered throughout the world, here and there one, feel the subtle influence called *esprit de corps*, and help each other. Mr. Atwater, an acute observer of the experiment stations of Germany, seems to put the enthusiasm the stations awaken, as not the least of their good influences. Students catch the spirit of their masters and carry it through life.

Again, the world is in need of accurate observers, of those who in common operations of life distinguish between what they know and what they think they know. The simplest statement an uneducated man can make of what has passed under his observation is apt to be crowded full of his theories, his inferences. It is one of the last attainments of a disciplined mind to be able to distinguish the fact from the inference and to state it clearly. Lawyers know this. Men like Liebig know it.

Now, it is hoped that the Agricultural College will serve this very purpose, of sending back to their farms men who have this discipline, and who will use it for the good of the State; men who, from their scientific training, from their habits of observation, will distinguish better than they otherwise could do, just what it is that they endeavor to tell. They will take moisture into account when they weigh, will describe the feed from which manure is made when they tell the effects of manuring, and in a hundred ways, even though not professing to experiment, *will* be genuine experimenters. I look eventually for great good to come from their efforts.

I have spoken chiefly of farm experiments. But our Horticultural department has been experimenting, our Chemical department has been busy with original investigations, and our Entomological department at the service of the farmers of the State. The work these departments have done has not been small nor unimportant. If many of the papers in which the results of their working appear are to be found in the horticultural reports, the reports of the State Board of Health and in scientific journals, they serve nevertheless for the advancement of science and education in the State.

RESULTS.

Let us look at the results of this experiment in a new system of education. And, first, *the college has a good number of students.* Many and few are comparative terms. You have to take account of circumstances when you use them. Cornell University has (1873-4) 461 students, and this college but 121. Their numbers are large and ours small. But Cornell University has nine distinct four-year courses, and we but one. In their agricultural course they have seven students, and we 121. Their numbers in this course are small and ours are large.

Let us consider this a little further. The young men are few who will take a fuller course of study than they think their business imperatively demands. And so doctors, lawyers, and clergymen slur over their preparatory, to enter at once on their professional education. The higher education is represented by Dr. Joseph Henry of the Smithsonian Institute as in "unstable equilibrium." It requires always the self-denying work of the few who appreciate it, to sustain it in community. All the students in all the regular classes in all the colleges of Michigan, the University included, did not in 1873 exceed 741. Our University, with its wide and well-earned fame, and free invitation to the world, catalogues in 1874-5, exclusive of law and medical students, 476 in its many courses.

Technological schools especially have but few students. Columbia College School of Mines, with a national reputation, and the services of 16 officers, besides the partial services of four others, has but 136 students (1872-3). Lawrence Scientific School of Harvard has 11 teachers and 35 students. The rich Stevens School of Technology had in its third year eight professors and 21 students. Yale Scientific School has 274 students, with a professor for each eight; the Massachusetts School of Technology has 375 students, and a professor for every 11 students. They have many courses of study.

Thorough technological instruction is costly, and not yet appreciated.

AGRICULTURAL STUDENTS FEW.

There are few students in agriculture the world over. "We have noticed the fact," says Louis Bollman, on Industrial Colleges, p. 21, "of the small number of students at the European agricultural schools." Discerning persons saw how it would be. Wilson Flagg in 1857, says: "It is more important to increase the desire for any branch of knowledge than the opportunities for gaining it." Paul Chadbourne, President of Williams College, was for years a member of the Massachusetts Board of Agriculture, then President of the Massachusetts Agricultural College. Obligated from ill health to resign that place, he was made President of Wisconsin University, of which the Agricultural College is a part. Speaking from his wide experience, he says: "There is at present (1869) no such demand for thorough agricultural education as is generally supposed to exist." "Very few young

men are willing to spend the time and money needed to learn what is now known as practical agriculture," and "a great deal is to be done in the community before our schools of agriculture can have the success which they even now deserve." Governor Chamberlain, of Maine, in his message to the legislature, says: "A farmer's college is a good and worthy idea, but that alone will not live and move. There are not enough boys who mean to go back to the farm after they have got through college."

The colleges bear out the prediction: especially mere departments of universities have few agricultural students. Take Cornell University, and its students are catalogued as follows (Register 1873-4, page 164): In science, 119; literature, 30; arts, 25; agriculture, 7; architecture, 21; chemistry, 7; engineering, 84; mechanic arts, 32; natural history, 6; optional studies, 120; resident graduates, 10; total, 461. Seven agricultural students in 461.

The University of Vermont and State Agricultural College trustees, in their report for 1873-4, page 12, use this language: "That young men do not come to us seeking such an education as a preparation for a life upon a farm does not surprise us. The idea that a farmer needs a thorough education, that he can make it serviceable to him as a farmer, that he is entitled to it, and to the social respect and public influence which it confers, it will take a long time to make familiar and operative in the farming community."

The President of the University of Minnesota, of which the State Agricultural College is a part (page 29 of report, 1873), reports 278 students, and says, "So far as I am aware, not a single man has come here desiring to learn the science of farming in order to practice it." The president now writes me that they have two students, and shall do much to develop the agricultural department soon. Bussey Institution, the Agricultural College of Harvard University, with an able corps of professors, has, I am told, but one regular student,—a graduate of the Michigan Agricultural College. Yale Agricultural College has almost no students in agriculture. The professors of these institutions are not idle, but in a certain sense have the world for their school.

President White, of Cornell University, writing of agricultural schools and departments, says of their students: "The number is at present very small, but I presume that no thoughtful man expected that so early a period after their establishment the number would be very large; nor indeed do I expect that for some years to come the number will greatly increase." In a new country like ours those professions which present the more brilliant returns will be sought for first.

The catalogue of the University of Wisconsin gives a separate place in its courses to agriculture; but although it catalogues students in classics, science, civil engineering, mining, and metallurgy, no one of its 411 students is put down as in the agricultural course. It is difficult to analyze the instruction in such colleges as Wisconsin, Illinois Industrial University, Kansas Agricultural College, Missouri University, and Iowa Agricultural College, and determine how much is agricultural. They may be doing good work, and doubtless will, in their scientific and agricultural departments. Their catalogues do not distinguish as a general thing. In Illinois a student may be pursuing two or more courses at once, and of its 406 students 39 would seem to have chosen agriculture as one, or by itself.

About one month ago (Jan. 13, 1875), the congressional committee on education and labor, after about a year's investigation into the affairs of the institutions established or assisted by the agricultural college land grant, reported to the house of representatives as follows: "The number of students in attendance upon these schools is already between 3,000 and 4,000; and they have furnished more than 1,600 graduates to the active occupations of life. * * * There is evidence of an honest purpose to make the studies pursued such in variety, in extent, and in value, as shall meet the requirements of the laws to which they are indebted for their endowment."—(p. 10.)

It appears then, that in every school, classical, technological, agricultural, the students are few compared with the great army of young men who are willing to do without a high education. One unacquainted with the principles of popular education would be tempted to inquire, when he sees the immense cost of colleges, universities, and technical schools, Whence all this waste? But I believe I address men who harbor no such misgivings. It has not been the wont of Michigan to put a low estimate on education, even in its highest and least frequented walks. I appeal for proofs to its generous support of its university, its normal school, and agricultural college. Instead of heeding that arithmetic which divides a total expenditure amongst a few students or graduates to show how expensive the education is, the State nurtured its university until, in spite of bitter opposition continued through many years, it is able to command respect. The agricultural college has had no fiercer opposition at any time than used to assail the university: its growth has not been less rapid. Being a professional school, it cannot, of course, receive the wide and high development of the university; and I believe the people of the State will continue to be generous to it in this, the period of its formation; will pardon, if need be, mistakes made in the working of a school so totally unlike the old models; give to the board that controls it

a large freedom of action; and now that its location seems to be settled, endeavor to make it the best, as it was the first of all the existing institutions of the list in the United States.

The history of education shows that the common school education depends upon the higher. Colleges and universities are the fountains without which there would be no supply of proper streams through union and common schools. It is not a building up, higher and higher from the primary; it is always a *drawing up* on the part of those who enjoy and appreciate a high education, that society is indebted to, for any great educational attainments.

Seeing, then, that we set up a high standard of education as preparation for a business for which public opinion demands but a meager knowledge; that we demand daily manual labor; that the influence of the larger part of teachers is to turn the attention of pupils to other schools; taking account also of the general expectation of educational men and the limited field the college occupies, the unexampled facilities Michigan affords for what is called a complete education, and the few that other colleges catalogue in their agricultural departments, *the college is even now successful in respect to numbers.*

GRADUAL INCREASE.

The number of students is increasing gradually. Taking three years at a time since the reorganization of the college, and the numbers ran as follows: 1860-2, 185; 1863-5, 200; 1866-8, 287; 1869-71, 349; 1872-4, 395. And the present year opens with a much larger freshman class than usual, containing half as many as are in the freshman class of the university department of literature, science, and art.

DOES THE COLLEGE GRADUATE FARMERS?

Colleges are not accustomed to graduate farmers. They take a young man in the susceptible period of his boyhood, keep him from manual labor, give him for association many who regard such work as a degradation, set before him only such aims as the professions, or literature, or public life propose, and what wonder that he is educated away from the farm!

In March, 1872, the United States bureau of education issued a circular of information regarding college graduates. Of the 622 graduates of Harvard in 24 years none are put down as agriculturists. Of the 570 graduates of Wesley University for 28 years, whose occupation is known, one devotes himself to agriculture. Of the 1,772 graduates of Yale in 20 years, whose occupation is known, 61 are agriculturists. Of the 1,254 Dartmouth graduates, whose occupation is known, not one is a farmer. Of all together there is less than 1½ per cent.

You might think it would not be so in the West, yet the same state of things exists here also. The Indiana State University catalogue for 1869-70, gives the occupation of 107 graduates, being the graduates from 1861 to 1869 inclusive, except 13 whose occupation was unknown. The catalogue says the students are mostly from the middle and even humbler walks of life, many of them having by their own efforts procured the means for their education. Now of these 107 graduates, whose business is known, three are farmers. Ripon College in Wisconsin publishes a list of its graduates from 1867 to 1874 inclusive, in its catalogue for 1874-5. Not one of the graduates for these eight years is a farmer.

According to the triennial catalogue of Oberlin College for 1870, 16 graduates out of 484 of the male graduates between 1837 and 1869 had become farmers. According to the same catalogue, out of 222 male graduates for 12 years, from 1858 to 1869, only four were farmers and horticulturists.

Colleges usually do not publish the occupations of their graduates. But the classes themselves often publish a paragraph of statistics, and one has only to read these as they appear annually to see how very small a proportion turn their attention to agriculture. When a graduate leaves the agricultural college he can become a farmer only if he owns or rents a farm, or hires out upon one. Scarcely any occupation requires so much capital as farming. Most of the graduates are poor. Even if the desire for a farmer's life is strong, he will very likely teach, or practice surveying, or do something which will earn him means to purchase land faster than hiring out on a farm can do.

Graduation *fixes* nothing. An honorable member of the House informs me that of the 24 who graduated with him in law, only four are practicing lawyers. Several other college men have told me they thought not over one-half the graduates of the professional schools practiced the professions, although to do so requires no large outlay as a farmer's business does. And yet we have all paid willing taxes to provide them an education they do not use in the prescribed line. So the graduates of the agricultural college will go into the business that seems to them best.

But it has been the design of those who manage the Agricultural College to create a bias towards, and not away from the farm; to make the whole atmosphere of the place one of respect for all kinds of work, and of a feeling of fellowship with farmers. To this end

manual labor is insisted on from all, if we can speak of insisting on what students offer in excess of our requirements. To this end there is no furnishing of easier or more tasteful work to the seniors than is given to other students; the habit of work and taste for it is kept up to the end. To this same end the labor system and the instruction are planned to match each other, to illustrate each other, so that to the labor is given some of the dignity of scientific work, and to the scientific instruction labor serves as a kind of laboratory practice for instruction.

To the same end the labor, instead of being a few hours now and then like that furnished in the dissecting room, is made a daily and continuous thing, a real and productive work, for which in return it is but fair, at least in the present undeveloped state of the college, that moderate compensation should be allowed.

The result of these efforts to create a truly agricultural school appears in the fact that in place of $1\frac{1}{2}$ per cent of graduates going to farming, as from other colleges, 38 per cent, or, not counting those not living and those who are still students, 42 per cent have gone to farming, fruit-raising, and the nursery business as their chief or only business. In this respect the college is doing what has never been done before,—sending men with good education in fair proportion back to work farms. If this agency is dropped, what is to supply its place? Not newspapers and clubs, for they fail to supply the underlying scientific training that is needed here and there through communities; not departments of colleges, for they will have almost no agricultural students; not the colleges themselves, for they educate all but $1\frac{1}{2}$ per cent of their graduates away from the farms.

What kind of farmers graduates will make remains in good part to be seen. No professional school educates a man to take at once a prominent place in the rank he enters. Farming is a business in which experience, native good judgment, and skill acquired in actual management, count for so much that graduates must be allowed time to find their proper place.

Diligent inquiry has failed to make it appear that they imbibe any habits of extravagance, or of a theorizing practice from their college course (as some have feared), in coming from a school for which the State does so much. All the graduates stand respectably in their several callings, and not a few of them stand very high.

STUDENTS IN SELECT STUDIES.

I have spoken of graduates only, merely because I have statistics regarding them. We are sometimes asked the cost of making a graduate, as if that work were the chief end of the college. But it is not. To educate young men is the chief end. We always have a body of young men who take a select course of study. These young men are amongst the oldest and most valuable of the students. We have, besides, many who come to take in regular course, the chemistry, botany, and agriculture, but who do not go through the course. The instruction imparted to them is equally valuable so far as it goes. A student who completes our sophomore, or second year, has had a year of botany and horticulture, a half-year of physical geography, a half-year of chemistry, a half-year of practice three hours a day in chemical analysis and surveying, besides a variety of other useful studies. By a half-year I mean one lesson, daily, five days a week, for one-half a school year. Our school year is the same number of weeks as at the university and at other colleges.

GRADUATES WHO ARE NOT FARMERS.

The preceding remarks refer to graduates and others who become farmers, as if the whole usefulness of the institution was to be measured by them. This is not true however. The influence of the peculiar education received here will make itself felt in whatever field of labor the graduates may enter. It is sometimes asked,

ARE THEY EMINENT?

As to this, how few are eminent in any calling!

Go through the long lists of law and medical graduates, and how many of them have attained to fame? Eminence is attained only now and then by the few who excel in talents, energy, or opportunities. Were all men eminent, none would be eminent. A college course, a professional course of study, moreover, only begins the education of any man; years of practice are required for perfection.

But the graduates of the agricultural college are here and there throughout the community, like other graduates, attending to the duties of their vocation, showing the results of their studies in their example, their conversation, their newspaper articles, essays, addresses, inciting young men around them to a desire for a higher education.

TEACHERS.

The agricultural college can point to its full share of graduates in honorable and responsible places. It is a credit to the college that Cornell University chose a graduate of ours

for her Professor of Horticulture and Botany; that he bore off the first Walker prize for an essay on a subject assigned by the Boston Society of Natural History; that he was selected as one of the two directors of a scientific expedition to the valley of the Amazon. It is to our credit that another graduate has held for several years the chair of agriculture in the University of Wisconsin, with great acceptance to the farmers and educators of the State; that the Professor of Horticulture in Iowa Agricultural College is our graduate, and that he has been invited, as the papers say, by the University of California, to deliver a course of lectures before that college. A graduate of ours was chosen to superintend farming operations for the Emperor of Japan, and returning with high testimonials of regard for his services, is now the Professor of Agriculture in Kansas Agricultural College. Another graduate is the Professor of Chemistry in Kansas Agricultural College; another is Professor of Zoölogy and Entomology in our own College; and still another is foreman of the college gardens. All these are directly engaged in furthering agricultural affairs, and make more than 50 per cent of graduates to be directly so occupied. I know of no literary college that can point to so large a proportion of its graduates in professorships of other colleges, as the Michigan Agricultural College.

WRITERS, ETC.

Our graduates are often called upon to use the pen, to give addresses, to serve on committees, and the like. The Western Rural has twice called in graduates as assistant editors, exclusive of work done by our Professor of Entomology, who is a graduate. The State Pomological Society's two meteorologists have been graduates, and have made annual reports. Our Professor of Entomology has served efficiently as its entomologist, and was, until the pressure of college duties made me ask him to resign, Secretary of the State Bee-keeper's Association. Other students and graduates have taken an active interest in the same association. A graduate headed one year the Orchard Committee of the State Pomological Society, and at the late meeting of this society five graduates and students had papers. The Pomological Society reports contain several articles from graduates.

This is no exhaustive catalogue,—but simply illustrations of the way our graduates are working.

One of the graduates is this winter an assistant editor of a St. Louis (Mo.) agricultural paper; another has a prize essay in an Indiana pomological report. In the various clubs and societies of the State, I find frequent mention of men whom I recognize as graduates or former students, as taking part, and I find their essays amongst those that are well received. Essays of young men will be very likely to fall short, in value, of the essays of men who have had long experience in what they write about, but they show that our young men have entered ardently into this field of labor.

I think it to the credit of the college that the only clergyman among its graduates was for three years, while preaching, the president of a farmers' club whose weekly attendance averaged more than 300 members. Whatever their business, our graduates manifest a deep interest in agricultural pursuits. One graduate was invited to become foreman of our farm, another to take a professorship at a good salary in a Western State University, and both declined to leave their farms.

LOVE FOR KNOWLEDGE.

I think it a great credit to the college that it has infused into its graduates a great desire for further knowledge. We are one of the very few institutions of learning that yearly retain a portion of their graduates for further study. The University has frequently received our graduates into its schools of engineering, pharmacy, medicine, or law. Several have put themselves under the educational charge of Professors Gray, Agassiz, and others at Harvard; one went to Cornell, where he afterwards served as an instructor for a year; one took courses of instruction at Yale; one is now a student of horticulture and botany in the Bussey Institution of Harvard; another is a student in the Massachusetts School of Technology; another has entered the Royal Veterinary College of Surgeons in London, England, where our diploma was received, I am informed, in lieu of examination and matriculation; and another, now a fruit-grower, spent two years at a university in Germany. Altogether, I doubt if any college in the land can make a better showing in this awakening of enthusiasm for knowledge. There are already many who are in their homes giving spare time to astronomy and other branches of study, from whom society has something to hope.

REPUTATION.

The institution has already won a good reputation in the nation. It was the first to be established of all the existing schools of this sort. Massachusetts sent each of her three presidents to visit it, and to copy in great part our plans. Maine copies it, and the former acting president and professor of agriculture spent some time here. A large part of the similar institutions have made personal examination of our plans, and have praised them. President

White of Cornell has been twice here, and always refers to the college as one of the best. Mr. Cornell himself was here, and spoke of it in terms of high praise. President Angell, coming into the State from Vermont, is reported in the Free Press of Nov. 16, 1871, to have said, "The Agricultural College was recognized as the best of its kind in the United States." He is said by the same paper to have added that "he had for the last five years been endeavoring to discover how best to establish an agricultural department to the institution with which he was connected, and in the time he had found out how remarkably little interest was felt in the application of science to agriculture."

Geo. Geddes of New York, whose name is familiar to agriculturists, has written to the N. Y. Tribune more than once, praising its experiments, its general management, and giving an account of his visit to it. He says, "I spent more than two weeks in the State of Michigan, and took considerable pains to inquire of doctors, ministers, and farmers as to the opinions of the people generally in regard to their Agricultural College, and in all cases was told that it was rapidly growing in public favor; and I heard nothing except in approval."

Mr. J. J. Thomas of the Country Gentleman visited the college last year, and has taken pains to express his approval of it in several papers. In his address at Adrian, he says, "The Agricultural College of the State has long stood in the front rank of the most efficient institutions of the kind in the world, and the labors of its able professors have been attended with eminent success."

The California State Grange, in a memorial to the Legislature criticising their own university, says (1874): "To Michigan belongs the honor of establishing the first Agricultural College, as long ago as 1855. Never since have the objects of such an institution been more fully comprehended."

Joseph Harris, author of "Walks and Talks," visited the college, examined its general management and the experiments going on, and has always referred to the college in terms of praise. His papers and his conversation testify to the high value he set upon our experiments.

In 1871 the National Bureau of Education commissioned Mr. Gillman, then a Professor in Yale Scientific School, to visit and report on the National Schools of Science. He reports of Michigan Agricultural College that its "success had been assured for many years past."

The American Agriculturist, Country Gentleman, Prairie Farmer, Michigan Farmer, and other papers whose managers were personally acquainted more or less with it, have frequently given a word of praise, and the press in general has been for the last few years desirous of aiding it. The Detroit dailies have, since the question of location stands settled, looked upon the college as one of the important institutions of the State, in whose doings the public has an interest; and I may safely say, no agricultural college stands higher in the country than our own.

ITS COST.

The institution has, no doubt, been costly, and the State liberal; and considering the unsettled questions of location and usefulness, very liberal. But if you leave out these considerations, and the reluctance to invest largely in a novel experiment, the appropriations have not been so large as they should have been. The sum expended looks exceedingly large in the aggregate, as did the long years of ticking and swinging backward and forward to the discontented pendulum, seen in one view.

But there is another way to look at the facts. General Ely, the Auditor General, reported to the House of Representatives Feb. 19, 1875, that "the amount drawn from the State Treasury on account of appropriations for the Agricultural College up to the close of the fiscal year ending Sept. 30, 1874, is \$418,977.18." At the same time, Dec. 1, the property of the State at the college was worth \$209,038. Subtracting the value of the property from the total appropriation, and dividing by 18, the number of years the college has been in active operation, and the average annual expense to the State has been less than \$11,664. If, before dividing, we add all that has been received (Dec. 1, 1874) from the Agricultural Interest Fund, the annual expenses will not equal \$13,825. If, again, before dividing, you add all that has been received from the sale of swamp lands, the average annual expense will not equal \$15,825. Surely no college could pretend to give scientific instruction in the various branches of agriculture, horticulture, chemistry, botany, entomology, and the other necessary branches of an agricultural college at a less annual expenditure than this, whether to a dozen students or 500.

While, therefore, in one view the State has been liberal, in another view the school has not had sufficient for a high development. The students yield practically no income, as almost nothing is required of them that does not go back to them. And while the farm has been a help, on the other hand all improvements on lands and buildings have been inventoried, as they always are, at far less than cost. The inventoried property in Michigan would not bring it from a wilderness into its present condition. If the State could afford

to give the college about two cents per each inhabitant for the years 1875 and 1876 each, in place of the $1\frac{1}{2}$ cent asked, improvements could go forward more rapidly.

In place of \$419,000 in 18 years, Pennsylvania gave its Agricultural College \$207,599 in four years; Massachusetts, \$313,000 in seven years; Illinois, \$235,300 in five years; and the young Iowa College has already received from the State \$329,480. These sums are proportionally much greater than the appropriations made for like periods to the Michigan Agricultural College.

The appropriations for current expenses in 1873 and 1874 were intended to supplement the interest of the college fund. This was taken at Governor Baldwin's estimates, which, owing to financial troubles occurring afterwards, were several thousand dollars greater than we received. The improvements at the college were curtailed therefore to that extent. As the college fund increases by the sale of lands, the appropriations to be made by the State will lessen, until at last only sums requisite for the erection and repair of buildings will be required.

I do not present the agricultural college as a piece of perfection. Probably no persons are more pained by its great lacks than the board and officers that manage it. But I present it to you as growing. It has come out of the forest, out of a surrounding of stumps and swamps, and puts on, in summer time at least, a face of beauty. Its students constantly increase in numbers, and honor it with their reverence and love. They go forth inspired with enthusiasm for scientific study, and with fixed habits of industry. Many of them carry this enthusiasm and these habits back to farms on which they live. They give labor its due honor; and we crave the hearty sympathy and counsel of the class for which we chiefly labor.

In establishing any other school of learning the officers and students would settle down to quiet work, hoping to show the results in the good education the students that leave them would exhibit. We have probably done too much the same, forgetting that while law, medicine, engineering, the classics, all have found their methods, we had also not only to invent a school, but to hold the interest of the farmers and the public who look to it, by a free publication of everything done here. In the reports for 1873 and 1874 I have put more of the reports of the departments, as made to me, than has been done before, and more still can be given hereafter, if desirable. And I hope the way will be open to the establishment of the highest degree of confidence between the college and all who are interested in its work.

EXPERIMENTS.

In response to a letter of inquiry from S. L. Kilbourne, representative in the legislature from this district, the following was written by Prof. Joseph Harris of Rochester, N. Y. It is dated at Moreton Farm, near that city, Feb. 26, 1875. Prof. Harris is an able scientific man and a good practical farmer. In England he was with Lawes and Gilbert, the celebrated agricultural experimenters. In this country he gained a high reputation as the editor of the *Genesee Farmer*, and he is now better known as the author of "Walks and Talks," in the *American Agriculturist*. From these papers he receives a higher price for agricultural articles than any other writer in the country. Prof. Harris is not only a sound scientific man and an able writer, but he is also one of the best practical farmers in Western New York. His letter to Mr. Kilbourne is as follows:

"I have had some experience in conducting systematic agricultural experiments, both on crops and animals, and have given the subject a good deal of thought.

"When I was appointed professor of agriculture in the Cornell University I visited the Michigan Agricultural College for the purpose of examining their methods of conducting experiments. I wanted to see what they were doing and how they did it. I thought if the different agricultural colleges would work together on some general plan we need not go over the same ground or cross each other's paths. I still think it would be wise to adopt such a course. But as yet our agricultural colleges, taken as a whole, have done very little for agriculture. I am not disposed to criticise. We expected too much from them. At our fairs and agricultural meetings, if some one asked whether salt was a good manure for wheat,

or ashes for corn, or plaster for grass, a dozen talking farmers would give their views, generally contradictory, and then the chairman of the meeting or some venerable gentleman would get up and say that in a year or two 'our agricultural college will be established, and then we shall have experiments that will settle the matter and give definite answers to all these questions.'

"The agricultural college was to tell us the best time to cut hay and the best way to feed it. It was to tell us whether it would pay to chaff fodder or to cook it. It was to tell us what is the best breed of horses, cows, sheep, and swine. It was to tell us whether it would pay to use this or that commercial manure. It was to tell us which crop was most profitable; whether, after deducting expenses, we could make most money from a crop of wheat, barley, oats, rye, corn, pease, beans, potatoes, grass, or roots. It was to answer the great question, 'Does farming pay?'—and woe to the professor if he did not answer it in the affirmative. We were to have a 'model farm' and an experimental station combined. The whole farm was to be devoted to trying experiments, and be made to pay into the bargain.

"I need not tell you that such expectations could not be realized. As a rule the experiments made at our agricultural colleges have been of little interest or value. They have settled nothing. Unless there is a better system adopted they never will give us the information we so much need. The great trouble has been the desire to make popular experiments, such as cooking food for stock or testing commercial fertilizers.

The Michigan Agricultural College is a bright exception to this dark picture. It has made some most important experiments. They have been evidently planned with great thought and after patient investigation. They are not hap-hazard experiments. They were made with a definite object. They bear the marks of scrupulous accuracy. Nothing is covered up, nothing omitted. We have all the details, and can draw our own conclusions from the results. They are not 'pen-and-ink experiments.' No one doubts their entire trustworthiness. They are not common experiments, such as any of us can make, and ought to make, on our own farms. They are scientific experiments. They are not designed to tell us merely whether an Essex or a Berkshire pig will make the most pork from 100 lbs. of corn, but they are designed to tell us *why*.

And this is what we want. And I must do Professor Miles the justice, and it is nothing more than justice, to say that his experiments on pigs have thrown more light on the *rationale* of pig-feeding than any other experiments of which I have any knowledge. They supplied the missing link. Lawes and Gilbert's grand experiments, continued on a large scale for several years, were with pigs nine months old. Dr. Miles in some cases commenced his experiments when the pigs were only two weeks old, and filled up the gap. If he never makes another experiment his name will occupy an honorable place in agricultural literature for years to come. But I hope his useful life will long be spared, and that the intelligent farmers of Michigan will stand by him and encourage him in his work. I know something of the labor of making scientific experiments. I know how difficult it is to plan an experiment which shall afford any definite conclusions. We have thousands of so-called agricultural experiments, interesting so far as they go, but they are mere fragments. They are inconclusive and often contradictory. We need definite knowledge in regard to fundamental principles. We must have this knowledge before we can make rapid advances. One man makes an experiment which shows a great saving in cooking food for hogs; another proves from an equally satisfactory experiment that it does not pay. Both are doubtless right: it depends on circumstances,—the breed, age, condition, etc., of the pigs; and before we can know when it will and when it will not pay to cook food for pigs, we must know more in regard to the processes of digestion and assimilation. Dr. Miles, by his experiments at the Michigan Agricultural College, has thrown more light on these fundamental questions than any other investigator.

"But I am saying much more than I intended. You ask me if "from a *practical point of view*, it would be desirable to continue at the Michigan Agricultural College the same system of experimenting, or would it be better to adopt some other methods?" By all means continue them. It will be a serious loss to agriculture if the experiments are discontinued. The Michigan Agricultural College now stands at the head of all similar institutions in this country. It is an honor to the State and to the country at large. Other methods should be added as the occasion requires, but the general design of the experiments can not be changed for the better. Above all do not aim to make popular experiments. Do not waste the time of scientific men and the money of the State in making experiments which prove nothing when you have got them. Any farmer in Michigan can ascertain whether plaster is a useful fertilizer on his farm for corn. What the college should aim at is, to first find out whether it does good on certain crops on the college farm, and *then* to ascertain, if possible, why it does good on some crops and not on others. This is what we want agricultural colleges and experimental farms for. They must make investigations which require more time, money, patience, and scientific apparatus than those of us who are exclusively engaged in the busy duties of the farm can afford to bestow. Do not let your scientific men at the college waste their time in ascertaining facts which we can find

out for ourselves. Do not tie their hands. Let them have full liberty to make such experiments as the interests of scientific agriculture demand. They ought to know, and I am sure Dr. Miles does know, what we need. Do not cripple them for want of means.

"We all hold Michigan in high honor for what she has done for agricultural science. The experiments on the college farm are becoming more and more interesting the longer they are continued, and it will be a great mistake to adopt any new and doubtful methods.

"I have alluded above to the experiments on pigs. The experiments on sheep, though not so extensive, are also of great interest and value. I saw some of these experimental sheep. They convinced me that we could easily raise good mutton and fine combing wool; and since then I have adopted on my farm the very same cross which the experiments showed to be so useful. We were told then, as we are told now, that the farmers of the United States could not raise combing wool. The experiments at the college showed that this was a great mistake. I cannot go into this matter, but I feel that the college has never received half the credit it is entitled to for the position then taken and for the facts which sustained it. These experiments alone might well be worth to the farmers of Michigan more than the entire cost of the college. I should be much pleased to see these sheep experiments continued on the plan Dr. Miles suggested in his report for 1868. It is precisely what we want, and I do not doubt that the results would be as interesting and instructive as the remarkable results from Dr. Miles' experiments on pigs.

"The field experiments, though evidently conducted with great care and labor, have not given us so much positive information as the experiments on animals. But negative results are not without value. It may save the farmers of Michigan more money to know that phosphates are not an economical manure for wheat, than to know that phosphates are valuable for turnips. A failure will sometimes teach a man more than a success. What we want is a well-planned experiment and an honest record of the result. We want truth, and this the Michigan Agricultural College gives us.

Yours respectfully,

JOSEPH HARRIS.

FIELD AND FEEDING EXPERIMENTS MADE AT THE MICHIGAN AGRICULTURAL COLLEGE.

Reports.

- 1863—pages 63-71. By Dr. Kedzie. Muck upon grass, hoed crops, and potatoes.
- 1864—pages 117-119. By Dr. Kedzie. On grass; plaster, ashes, etc.
- 1865—pages 235-239. By Dr. Miles. Top dressing of grass lands.
- 1866—pages 51-54. By Dr. Kedzie. Agricultural chemistry; muck and night soil.
- 1866—pages 55-59. By Dr. Miles. Top dressing on grass; manures to corn.
- 1866—pages 59-62. By Dr. Miles. Pig-feeding.
- 1867—pages 39-52. By Dr. Miles. Sheep-feeding.
- 1867—pages 53-54. By Prof. Prentiss. Fertilizers; corn.
- 1868—pages 47-72. By Dr. Miles. Sheep-feeding.
- 1868—pages 73-97. By Dr. Miles. Pig-feeding.
- 1868—pages 99-128. By Dr. Miles. Fertilizers.
- 1868—pages 129-149. By Dr. Kedzie. Agricultural chemistry.
- 1868—pages 150-152. By Prof. Prentiss. Fertilizers.
- 1869—pages 53-71. By Dr. Miles. Pig-feeding.
- 1869—pages 73-104. By Dr. Miles. Fertilizers.
- 1869—pages 190-194. By W. K. Kedzie. Steeping seeds in brine.
- 1870—pages 75-92. By Dr. Miles. Pig-feeding.
- 1870—pages 93-117. By Dr. Miles. Manures.
- 1870—folded sheet between pages 118-119. By Prof. Prentiss. Tomatoes.
- 1873—pages 108-132. By Dr. Miles. Pig-feeding.
- 1873—pages 123-139. By Dr. Miles. Fertilizers.

The report for 1871 contains (pages 291-389) the proceedings of a convention for the discussion of college experiments. Great pains was taken to correct all errors in the newspaper reports by correspondence with the various persons who took part in the discussions.



